WHAT MAKES A GOOD 8D INVESTIGATION?

Tools & Tips Webinar sponsored by the RM13000 Problem Solving Community of Practice

May 25, 2022
WHAT MAKES A GOOD 8D?

ADAM ROGERS
LEAD QUALITY CONTROL ANALYST
HONEYWELL
WEBINAR OVERVIEW

We are recording today’s webinar and will distribute the video link following the close of the webinar. It will also be posted on the AESQ website for free viewing.

We will take questions during today’s webinar using the Chat feature.

Please remain on Mute during the presentation to prevent background noise. We will also be muting all lines at the start of the session.
WHAT MAKES A GOOD 8D INVESTIGATION?

Agenda – 90 minutes

Who is the 8D Subject Matter Interest Group

Adam Rogers - Honeywell

Why this webinar? Where can we find help?

Adam Rogers - Honeywell

What makes a good 8D?

Pete Teti – Pratt & Whitney

Do you need all 8D steps for every problem type?

Pete Teti - Pratt & Whitney

8D on a page

Pete Teti - Pratt & Whitney

The Magnificent Seven

Pete Teti – Pratt & Whitney

Examples

Pete Teti – Pratt & Whitney

Interaction with Human Factors

Catherine Catarina-Graca – Safran

Addressing Human Error as part of 8D

Catherine Catarina-Graca – Safran

Interaction with the other AESQ Reference Manuals

Catherine Catarina-Graca - Safran

Q&A

Team

Summary and Close

Pete Teti – Pratt & Whitney
EIGHT DICIPLINES (8D) METHODOLOGY

Purpose of this training

Introduce quality and manufacturing associates to the 8D RCCA investigation methodology defined in AS13100 and RM13000, “Problem Solving Methods including 8D”

Communicate why 8D has become the standard for root cause investigations that suppliers to aerospace engine OEMs will work to

Understanding that AS13100 is being flowed down by PW, RR, GE, HW, Safran, Arconic, PCC, IHI and GKN (all members of the AESQ)

Reference Manual RM13000 provides the step-by-step help for properly documenting a root cause investigation using the Eight Discipline (8D) process
8D OVERVIEW

Background

Eight Disciplines (8D) Problem Solving

Method developed at Ford Motor Company in 1987 used to approach and to resolve problems, typically employed by engineers or other professionals

Focused to identify, correct, and eliminate recurring problems

Establishes a permanent corrective action based on cause & effect analysis of the problem

Originally comprised of eight stages, or 'disciplines', it was later augmented by an initial planning stage called D0 (Preparation and Initial Containment Actions)

8D follows the logic of the PDCA cycle developed by Walter Shewhart and W. Edwards Deming over 80 years ago

8D has since become very prevalent in industry and has now been adopted by the AESQ as the standard for RCCA investigations
The purpose of the 8D Subject Matter Interest Group is to promote the effective deployment of the 8D problem solving methodology across the AESQ Supply Chain.

The Group is made up of Subject Matter Experts from the AESQ Member Companies.

The Group is accountable for the AS13100 related Requirements and associated Reference Manual content, ensuring that it is up to date and reflects current knowledge and best practice.

It shall promote the effective deployment of the Reference Manual using Communities of Practice (CoP). The CoP is open to any subject matter expert from the AESQ Member Companies and the wider AESQ supply chain.

Activities may include webinars, best practice sharing, development of shared training materials, conferences and published papers.

https://aesq.sae-itc.com/interest-groups
Who is the Problem Solving Methods SMIG Team?

Meets every two or three weeks

SUBJECT MATTER INTEREST GROUPS

Marnie Ham
GE
(Leader)

Catherine Catarina
SAFRAN

Pete Teti
PWA

Adam Rogers
HW

Tobias Kranz
MTU

Julie Fouquet
SAFRAN

Peter Papadopoulos
PWA

Jun Sakai
IHI

Sharron Magowan
RR

Vaclav Pisa
GE

AESQ – Aerospace Engine Supplier Quality Strategy Group

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8D PROBLEM SOLVING SUPPORT

Why this webinar?

Communicate what is expected to be part of an 8D investigation

Provide guidance when preparing an 8D investigation package

Promote the available free documents and tools that can be used by any AESQ supplier

Answer questions suppliers may have about the 8D process
8D PROBLEM SOLVING SUPPORT

Where to get help

AESQ Supplementary Materials webpage for a copy of RM13000 and supporting templates

https://aesq.sae-itc.com/supplemental-material

Subject Matter Interest Group – meets 2nd Monday of each month – supports continuous improvement of RM13000 and supporting templates & tools

AESQ Problem Solving Methods (RM13000) Community of Practice on Linked In

Current membership is 168 – let’s get some more!!
WHAT MAKES A GOOD 8D?

PETER E. TETI
FELLOW, QUALITY ENGINEERING
PRATT AND WHITNEY
WHAT MAKES A GOOD 8D?

**Some things to look out for**

Problem Statement

Identifying the Generation and Escape Points in the process

Addressing Direct, Detection and Systemic causes

Identifying Emergency, Interim, Permanent and Preventive actions

Addressing sources of human error

Developing error-proof solutions as corrective actions

Corrective actions that align with root causes

PFMEA documents are all updated

Measures of effectiveness are established

Preventive measures taken such as read-across on similar part numbers, QMS procedures, design manual updates, and and PFMEA documentation update

**ASK THE KEY QUESTIONS**

1. Was the suspect population identified and contained?
2. Were the appropriate stakeholders, disciplines and experts engaged to complete the analysis?
3. Is the problem defined and supported with data?
4. Were interim (temporary) actions verified not to cause other problems?
5. Were the direct cause/generation point and detection cause/escape point identified?
6. Was the cause of the system breakdown determined?
7. Is RCCA tool usage appropriate and evident?
8. Have permanent corrective actions been identified, verified to work, validated to be in place, and effective?
9. Have proper controls been put in place and documented to prevent recurrence?
10. Have the lessons learned from this 8D investigation been applied to other parts, processes, and/or sites, i.e., read across/PFMEA update?
PROBLEM SOLVING TYPES

What type of problem is it?

Line shutdown

Draw upon additional 8D steps if needed

If no go here next

When to use 8D
- Need for Emergency Containment
- Need for Population Bounding
- Need for Interim Containment
- Root cause(s) and solution(s) not obvious
- Ex. 1: Escape found at Customer
- Ex. 2: Escape found at supplier (e.g., NOE)

When to use 4D
- No need for Emergency Containment Action
- No need for Population Bounding
- Problem contained to a specific area inside company
- Interim containment not always needed
- Root cause(s) and solution(s) not known but ideas abound
- Document using basic root cause tools
- Ex. 1: Part feature found to be nonconforming
- Ex. 2: Measurement system bias discovered
- NOTE: Add additional 8D steps when needed (e.g., D3, D7)

When to use 2D
- Resolved immediately without a lengthy investigation
- Fix and move on; typical of many shop floor problems/turndowns
- Cause and solution are generally known
- Not likely to need containment actions
- Confined locally to a specific work station
- Ex. 1: Replace battery in flashlight
- Ex. 2: Replace light bulb when burnt out
- NOTE: Add additional 8D steps if needed (e.g., D3, D4)

If no go here next

PROBLEM SOLVING TYPES

8D procudure
Systematic Problem Solving

D0 Immediate action
D1 Define Team
D2 Define Problem
D3 Interim Containment
D4 Determine Causes
D5 Develop C/A's
D6 Implement PCA's
D7 Preventive C/A's
D8 Recognize Team
Check effectiveness

4D Method
Compact Problem Solving

D2 Define Problem
D4 Determine Causes
D6 Implement PCA's
Check effectiveness

Find and Fix

Draw upon additional 8D steps if needed

2D Simple Problem Solving

D2 Define Problem
D6 Solve Problem

If no go here next

Check effectiveness

Major/Complex

Simple/Minor
## EIGHT DISCIPLINES (8D) ON ONE PAGE

**Structured Problem Solving Process**

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>0. Immediate Containment</strong></td>
<td><strong>1. Define the Team(s)</strong></td>
<td><strong>2. Problem Description</strong></td>
<td><strong>3. Interim Containment</strong></td>
<td><strong>4. Root Causes Analysis</strong></td>
<td><strong>5. Short &amp; Long Term Actions</strong></td>
<td><strong>6. Action Validation</strong></td>
<td><strong>7. Prevent Recurrence</strong></td>
</tr>
<tr>
<td><strong>D0</strong></td>
<td><strong>D1</strong></td>
<td><strong>D2</strong></td>
<td><strong>D3</strong></td>
<td><strong>D4</strong></td>
<td><strong>D5</strong></td>
<td><strong>D6</strong></td>
<td><strong>D7</strong></td>
</tr>
<tr>
<td><strong>Stop</strong></td>
<td><strong>Skills</strong></td>
<td><strong>Impact</strong></td>
<td><strong>Production</strong></td>
<td><strong>Causes</strong></td>
<td><strong>Solve</strong></td>
<td><strong>Validate</strong></td>
<td><strong>Recurrence</strong></td>
</tr>
<tr>
<td><strong>Emergency Response Actions</strong></td>
<td><strong>Charter Teams to Correct</strong></td>
<td><strong>Define &amp; Describe Problem</strong></td>
<td><strong>Temporary Containment Actions</strong></td>
<td><strong>Verify Root Cause(s)</strong></td>
<td><strong>Permanent Corrective Actions</strong></td>
<td><strong>Implement &amp; Validate Actions</strong></td>
<td><strong>Preventive Actions</strong></td>
</tr>
<tr>
<td>Immediate ContainmenActions</td>
<td>Resource the Team (Product &amp; Process Knowledge)</td>
<td>Baseline &amp; Supporting Data</td>
<td>Help Customer get product again</td>
<td>Tree Diagram, 5-Why</td>
<td>Mistake-Proofing</td>
<td>Apply Best Measures</td>
<td>Read Across</td>
</tr>
<tr>
<td>Bound &amp; Quantify the population</td>
<td>Prioritize the Effort</td>
<td>5W + 2H</td>
<td>Risk Mitigation</td>
<td>Direct, Detection and Systemic</td>
<td>Evaluate actions with Solution Selection Matrix</td>
<td>Ensure Effectivity</td>
<td>Update PFMEA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem Definition Tree</td>
<td></td>
<td>Human Error</td>
<td></td>
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</tr>
</tbody>
</table>
THE MAGNIFICENT 7 – BOTTOM LINE

For any 8D investigation it comes down to these

What to address for a successful 8D investigation

1. Direct Cause
2. Detection Cause
3. Systemic Cause
4. D0 – Emergency Containment
5. D3 – Temporary Containment
6. D5 – Permanent Corrective Action
7. D7 – Preventive Action

Any customer escape requiring an 8D investigation needs to address these seven boxes
THE THREE ROOT CAUSE CATEGORIES

Identify the controllable root cause for each of the categorized causes

DIRECT – Why was the nonconformance created? Focus on the “generation point”.
DETECTION – How did we fail to catch it before it got to the customer? Focus is on the “escape point”.
SYSTEMIC – Why was the overall system weak in the first place?

DIRECT ROOT CAUSE
- Why was the customer complaint created? How did we create the problem? What is the product failure mode? Where is the generation point in the process?

DETECTION ROOT CAUSE
- Why was the problem not detected by the quality system? How did the customer find the problem and we didn’t? Where are the escape points in the process?

SYSTEMIC ROOT CAUSE
- How was the problem introduced? How did product development/production/support processes contribute to the problem? Did any business processes fail?

Those who do the work
- Production people
  - Operator
  - Inspector
  - Shop Floor Control

Those who create the processes, procedures and instructions
- Production support people
  - Management
  - Manufacturing/Quality Engineer

AESQ – Aerospace Engine Supplier Quality Strategy Group
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THE THREE ROOT CAUSE CATEGORIES

DIRECT CAUSE
Associates with the “generation point” in the process; where the chain of events started; what triggered the investigation; some may also refer to this as the “manufacturing cause”

Direct causes are typically closest to those who execute a specific task or operation (i.e., Operator)

Associated with the immediate problem

DETECTION CAUSE
Associates with the “escape point” in the process; where the process released the nonconformance to the Customer; Asks the question “how did we fail to find the issue before it got away?”; some may also refer to this as the “quality cause”

Detection causes are typically closest to those who inspect a specific task or operation (i.e., Inspector, Final Inspector, DQR, etc.)

Associated with the immediate problem

SYSTEMIC CAUSE
Associates with the term “read across” as part of D7 in the 8D investigation process; Asks questions such as “where else could this problem pop up?”, “what other parts are made on this errant machine” and “could other suppliers produce the same nonconformance?”, etc.

Systemic causes are addressed by changes in QMS procedures, drawing specifications, company policies and PPAP documents such as the Process Flow Diagram, PFMEA and Control Plan. These changes affect a broader range of product & processes than just the one that started the whole chain of events

Don’t forget to update your PFMEA documents!
D0 – IMMEDIATE PROTECTIVE ACTION

- Also referred to as “Emergency Containment Action” taken to STOP suspect parts from continued shipment to the Customer

- *Example include:*
  - Performing a population bounding to clearly identify all suspect material. This may include ascertaining from the supplier within 24 hours they checked their production WIP, Finished Stores, and product in transit that may be part of the suspect population.
  
  - Notifying internal and external Customers via a “Notification of Potential Quality Escape” so they can segregate suspect material from their production/assembly process.

D3 – INTERIM CONTAINMENT ACTION

- Also referred to as “Temporary Containment Action” taken to get good product to the Customer so they can get PRODUCTION going again.

- *Example include:*
  - The over-inspection of suspect material from a bounded population and separating the good from the bad in order to ship the good product to the Customer in order to keep their production line moving.
  
  - Setting up a rework or repair line to address the nonconforming product
• **D5 – PERMANENT CORRECTIVE ACTION**
  • The action(s) taken to permanently SOLVE the problem that initiated the investigation at both the Generation and Escape points of the process.

  • *Example include:*
  • Adding clearer work instructions and inspection instructions at both the Generation and Escape points of the process.
  • Modifying the process in terms of its tooling, fixturing, source of raw materials, measurement methodology, etc.

• **D7 – PREVENTIVE ACTION**
  • The action(s) taken to prevent problem RECURRENCE not only on the initiating problem but related product and processes resulting from a thorough read-across conducted by the supplier. This action focuses on the systemic causes of the problem.

  • *Example include:*
  • Revising QMS procedures
  • Revising the Design Manual or Lessons Learned Database to help avoiding this failure mode on future products.
  • Implementation of more robust preventive (error-proofing) and detection-based controls at the Generation & Escape points of the process for the initiating part/process as well as those identified in the read-across.
  • Updating your PFMEA documents
WHAT MAKES A GOOD 8D?

Start with one of the AESQ templates available at https://aesq.sae-itc.com/supplemental-material

- Provides the following:
  - 8D milestone plan
  - Problem Statement
  - All 8D Steps
  - Generation and Escape Points
  - 5-Why drill down for direct, detection and systemic causes
  - Corrective action plan
  - Format in Microsoft Excel

See Oil Pan Bracket Case Study #1, Page 23 in RM13000 for real-life 8D illustration using this form
WHAT MAKES A GOOD 8D?

Start with one of the AESQ templates available at https://aesq.sae-itc.com/supplemental-material

8D Step

- 8D milestone plan
- Generation and Escape Point identification
- 5-Why drill down for direct, detection and systemic causes
- Corrective action plan
- Format in PowerPoint

See Machined Disk Case Study #2, page 24 in RM13000 for real-life 8D illustration using this form
WHAT MAKES A GOOD 8D?

Start with one of the AESQ templates available at https://aesq.sae-itc.com/supplemental-material

Provides the following

- All 8D Steps
- Four key actions broken out
- Key DO emergency containment questions
- Problem Statement
- Generation and Escape Points
- 5-Why drill down for direct, detection and systemic causes
- Corrective action plan
- Format in Microsoft Word
- Supported by 8D Reporting Template
### WHAT MAKES A GOOD 8D?

**Part Marking Example using Microsoft Word Template**

**EIGHT DISCIPLINE (8D) ROOT CAUSE INVESTIGATION REPORT**

**8D Report #108**

**Warning:** Once completed, the Jurisdiction & Classification of the form must be obtained to comply with export regulations.

<table>
<thead>
<tr>
<th>Contains Technical Data</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification Date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Export Classification (EAR not ITAR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other restrictions or comments (IP)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**General Information**

<table>
<thead>
<tr>
<th>Supplier Name</th>
<th>Belcan Part Marking Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Code</td>
<td>12345</td>
</tr>
<tr>
<td>Supplier Name</td>
<td>Belcan Part Marking Cell</td>
</tr>
<tr>
<td>Supplier Code</td>
<td>12345</td>
</tr>
<tr>
<td>Supplier Email</td>
<td><a href="mailto:benada.olson@belcan.com">benada.olson@belcan.com</a></td>
</tr>
<tr>
<td>Supplier Phone</td>
<td>860-234-5678</td>
</tr>
<tr>
<td>Customer Name</td>
<td>John Doe</td>
</tr>
<tr>
<td>Issued Date</td>
<td>9/4/2019</td>
</tr>
</tbody>
</table>

**Description of Nonconformity:** Ink marking was used instead of Integral marking on various P/N's – Wrong method

**Specification Requirement:**
Mark per Customer specification ABC-123, Class 30. Note field of drawing requires Integral Marking method to apply.

**Description of the actual condition (failure mode):**
The applicable drawing showed the marking symbol and stated: “Mark identification per spec ABC-123, Class 30”, allowing for temporary Ink 3.2.6 or Integral 3.1. However, the drawing field specifically showed the marking symbol with an additional compound symbol indicating Integral Marking required.

---

**What if it was a PPAP part?** Then a pFMEA would be required. This means a process flow diagram is available that could be used to document the Generation and Escape Points. Also, a Control Plan could be reviewed for the current detection controls called out.
WHAT MAKES A GOOD 8D?
Part Marking Example using Microsoft Word Template

D1: Form the Team (Identify specific Subject Matter Expert(s) (SME) and supporting team members)

<table>
<thead>
<tr>
<th>Team Leader</th>
<th>Team Leader’s Phone #</th>
<th>Team Leader’s Email Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jim Lang</td>
<td>660-123-4567</td>
<td><a href="mailto:jim.lang@beican.com">jim.lang@beican.com</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Team Members</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brenda Olson</td>
<td>660-234-5678</td>
<td><a href="mailto:brenda.olson@beican.com">brenda.olson@beican.com</a></td>
</tr>
<tr>
<td>Gil MacSatta</td>
<td>660-345-6789</td>
<td><a href="mailto:gil.macsatta@beican.com">gil.macsatta@beican.com</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>John Doe</td>
<td>660-456-7890</td>
<td><a href="mailto:john.doe@gw.nx.com">john.doe@gw.nx.com</a></td>
</tr>
</tbody>
</table>

D2: Define the Problem/Issue (Enter a problem statement using quantifiable terms; Address problem Generation and Escape Points; Describe problem aspect)

**Background Statement:**

On September 4, 2019, Supplier ABC submitted a Part Marking Request for #0765-01. On September 5, 2019 an Approval was sent to Supplier ABC by the Belcan Part Marking Cell. On September 17, 2019, the Belcan Part Marking Cell was notified that a QM (40539787 / SDS 23915) had been issued against the marking due to the mark using the incorrect method. The required method as indicated in the field of the drawing should have been integral marking, not the ink marking Supplier ABC used.

Note 4 was read and a review of the field of the dwg was reviewed and a flag was noted. The content of the markings was correct and therefore an Approval was issued. The Cell failed to observe, as did the supplier, the additional compound symbol in the field of the drawing that required integral marking.

**Problem:** The Supplier, the SGIAR and the Part Marking Cell all read Note 4 on the dwg and looked for either Temp Ink or Integral to be used as a method. During rework, the emphasis was placed on using a more permanent ink due to the temp ink rubbing off with handling or alcohol. Through all of these processes, the field of the dwg was not examined showing Compound Symbol standing alone.

**PROBLEM STATEMENT:** Supplier ABC had their part marking approved by the Belcan Cell when it should have been rejected (Type II Error)

D3: Complete Interim Containment Action(s) (Identify the temporary actions taken to help the Customer get back into production. Describe verification actions taken to assure interim actions do not result in other problems)

List action(s) on a separate sheet if necessary

<table>
<thead>
<tr>
<th>Action Owner</th>
<th>Planned completed date</th>
<th>Completed date</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Olson</td>
<td>11/07/2019</td>
<td>11/07/2019</td>
</tr>
</tbody>
</table>

D4: Identify, Analyze, and Verify Root Causes: (Use appropriate problem analysis tools contained in the 8D Tool Section to address both the Direct Cause(s) at Generation Point and Detection Cause(s) at Escape Point of the process)

Process/Manufacturing Cause – Generation Point:

Per 5-Why analysis, Supplier ABC’s operator marked part with ink method as that was the method called out on his operation sheet. Additionally, the M.E. who prepared the operation sheet only read the note on sheet 1 of the drawing and missed the compound note in the drawing field that require integral marking.
WHAT MAKES A GOOD 8D?

Part Marking Example using Microsoft Word Template

Notes on using the 5-Why Diagram
- Do not limit yourself to one singular path if other paths are obvious
- Use the “therefore” test to assure the 5-Why layers make sense
- Identify potential C/A at the various layers
WHAT MAKES A GOOD 8D?

Part Marking Example using Microsoft Word Template

<table>
<thead>
<tr>
<th><strong>WHAT MAKES A GOOD 8D?</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Part Marking Example using Microsoft Word Template</strong></td>
</tr>
</tbody>
</table>

**D5: Identify Permanent Corrective Action(s):** (Address why the customer found the problem and the supplier did not; Verify CAs will not cause further problems; 30 Days (reference))

<table>
<thead>
<tr>
<th>Action(s) on a separate sheet and attach if necessary</th>
<th>Action Owner</th>
<th>Planned implementation/completed date</th>
<th>Implementation/Completed date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Review with Engineering actual design intent for the current part marking new applied</td>
<td>M. Mouse</td>
<td>1/11/2020</td>
<td>11/19/2019</td>
</tr>
<tr>
<td>2. Refer Item 5, based on the engineering intent, request engineering to modify drawing to match</td>
<td>M. Mouse</td>
<td>1/11/2020</td>
<td>11/19/2019</td>
</tr>
<tr>
<td>3. Refer Item 3, if engineering agrees to clarify drawing to prescribe integral only, recommend to update DM and DSM with components symbol standard note</td>
<td>M. Mouse</td>
<td>01/21/2020</td>
<td></td>
</tr>
<tr>
<td>4. Update Part Marking Standard Work (old lessons learned to P9226 form)</td>
<td>B. Olson</td>
<td>12/12/2019</td>
<td></td>
</tr>
<tr>
<td>5. Modify ABC-123, Appendix D to make the words “Temporary Method” more visible (bold)</td>
<td>M. Mouse</td>
<td>03/31/2020</td>
<td></td>
</tr>
</tbody>
</table>

Describe PCA Verification completed: Part Marking System Team will meet on a weekly Thursday meeting until all items are closed out.

**D6: Implement Permanent Corrective Action(s):** (Validate PCA(s) are in place; Check root causes at Generation and Escape Points do not come back; Review Lessons Learned Containment measures)

- Have all PCA(s) been implemented?
  - Yes ☑ No ☐

- Has the problem reoccurred? If "Yes", Supplier to go back and redress D3 and D4.
  - Yes ☐ No ☑

**D7: Define Systemic Preventive Action(s):** (Read across actions such as changes to the QMS, applying CA to other PNs, implementing a plan for measuring effectiveness, etc.; 60 Days (reference))

- Are similar parts and/or processes affected?
  - Yes ☑ No ☐ Have Lessons Learned been documented?
    - Yes ☑ No ☐

- Have all FMEA documents been updated (e.g., Process Flow Diagram, PFMEA and Process Control Plan)?
  - Yes ☑ No ☐ Corrective Action Accepted Date __________

- Describe plan to measure effectiveness of all corrective and preventive actions implemented (i.e., inspection lots verified)
  - Items 3-5 under Permanent CA are actually Preventive Actions that impact multiple PNs either currently active or yet to be designed

**D8: Team and Individual Recognitions:** (Validate the SD Team was recognized for completing this investigation)

- Originator Name (PRINT): B. Olson to acknowledge completion and team effort at monthly ecosystem review
- Date: 12/19/2019
8D INTERACTION WITH HUMAN FACTORS

CATHERINE CATARINA-GRACA
SUPPLIER MANAGEMENT SYSTEM COORDINATOR
SAFRAN AIRCRAFT ENGINES
TAKE THE HUMAN AND ORGANIZATIONAL ASPECTS INTO ACCOUNT IN THE 8D CAUSAL ANALYSES

The new revision of AS9100D - Chapter 10.2

“Nonconformity and corrective action” will require us to “evaluate the need for action based on human factors to ensure non conformities do not recur.”

AS13100 is requiring HF investigation and RM13010 gives some tools that can be used.
## 8D STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>HF contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D0</strong></td>
<td>Make a preliminary analysis of the problem</td>
<td><strong>Ensure that the emphasis is placed on the situation, time, location and impacts and not on the person(s) at the origin of the event.</strong>&lt;br&gt;<strong>Work directly in the 8D by bringing the specific features of HF into the context of the 8D team formed.</strong>&lt;br&gt;<strong>Ensure that the FH skills are present.</strong>&lt;br&gt;<strong>Challenge the characterization of the event and of the error from a human and organizational viewpoint.</strong>&lt;br&gt;<strong>Ensure that the description of the event does not contain value judgments, interpretations or opinions.</strong>&lt;br&gt;<strong>Ensure that the root causes linked with the persons and the organization have been studied.</strong>&lt;br&gt;<strong>Characterize the facts from a human and organizational viewpoint. (dirty dozen, Swiss cheese Model …)</strong>&lt;br&gt;<strong>Challenge the chosen solutions.</strong>&lt;br&gt;<strong>Propose solutions already applied in other similar activities.</strong>&lt;br&gt;<strong>Take part in the on-site observation in order to check the effectiveness of the corrective actions and collect the feedback.</strong>&lt;br&gt;<strong>Ensure that the feedback is shared within the HF network.</strong>&lt;br&gt;<strong>Update the catalog of HF solutions / best practices.</strong>&lt;br&gt;<strong>Conclude the group and congratulate the team.</strong></td>
</tr>
<tr>
<td><strong>D1</strong></td>
<td>Form the team</td>
<td></td>
</tr>
<tr>
<td><strong>D2</strong></td>
<td>Define the problem to be processed</td>
<td></td>
</tr>
<tr>
<td><strong>D3</strong></td>
<td>Contain the risks</td>
<td></td>
</tr>
<tr>
<td><strong>D4</strong></td>
<td>Find the root cause(s)</td>
<td></td>
</tr>
<tr>
<td><strong>D5</strong></td>
<td>Define and select the corrective actions</td>
<td></td>
</tr>
<tr>
<td><strong>D6</strong></td>
<td>Implement the chosen actions and check their effectiveness</td>
<td></td>
</tr>
<tr>
<td><strong>D7</strong></td>
<td>Capitalize, perpetuate, generalize</td>
<td></td>
</tr>
<tr>
<td><strong>D8</strong></td>
<td>Conclude the group and congratulate the team</td>
<td></td>
</tr>
</tbody>
</table>
TAKE THE HUMAN AND ORGANIZATIONAL ASPECTS INTO ACCOUNT IN THE 8D CAUSAL ANALYSES

- Take into account contributive factors to prevent recurrence
- Organizational failures must be identified because of their influence on human performances.
- They produce situations conducive to error: communication, distance from the field, lack of experience...
The Reference Manual Interactions

8D investigations (RM13000) will interact with failure mode and cause identification (RM13004), which includes sources of human error (RM13010), and identified process control methods (RM13006) as corrective actions.
AESQ 8D INTERACTIVE TOOL

Instructions

From the control panel on the next slide, in presentation mode, all the boxes are live links that will redirect you to different places in the presentation.

Tools for D4

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
<th>Use when...</th>
<th>Template</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault Tree Diagram</td>
<td>A structured process for analyzing potential causes of failure. The fault tree structure is associated with the combined probability of underlying events causing the top level event to occur.</td>
<td>To determine the logical interaction and probabilities of potential contributors to the top level event under study.</td>
<td>5-Why Template</td>
</tr>
<tr>
<td>Causal Factor Map</td>
<td>Excellent training webinar for creating effective Causal Factor Map. For more information/training availability, go to <a href="http://www.thinkreliability.com">www.thinkreliability.com</a>.</td>
<td>Excellent tool built on the 5-Why principle that does not constrain the user into just one linear path. Use to diagnose the causes of a problem at a variety of levels.</td>
<td>Causal Factor Map Template</td>
</tr>
<tr>
<td>Defect Concentration Chart</td>
<td>For reviewing physical location of defects on a particular part/process overtime to determine if there are any patterns</td>
<td>To determine if the non-conformance is random or concentrated to a specific location/area.</td>
<td>Defect Concentration Chart</td>
</tr>
<tr>
<td>Cause and Effect Diagram</td>
<td>A brainstorming tool that can be used to identify and prioritize potential factors contributing to the clearly defined problem.</td>
<td>To capture and organize the team's ideas of potential contributing factors to a problem, to prioritize potential factors that will require further investigation.</td>
<td>Cause and Effect Diagram</td>
</tr>
<tr>
<td>3 Legged 5 Why</td>
<td>A problem-solving technique of continuously asking “why” to get to the root of a problem. The 3 categories or “legs” represent: direct failure detection, and system root causes</td>
<td>To identify the controllable root cause for each of the categorized causes and to drive improvement in detection and systems in addition to specific failure mitage-proofing.</td>
<td>3 Legged 5 Why</td>
</tr>
<tr>
<td>Gauge Capability (R&amp;R) Study</td>
<td>A tool to quantify and evaluate sources of variation in the measurement system.</td>
<td>To understand the impact of the variation associated with the measurement system.</td>
<td>Gauge R&amp;R Study Template</td>
</tr>
</tbody>
</table>

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AESQ – Aerospace Engine Supplier Quality Strategy Group

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### AESQ 8D Interactive Tool Control Panel

<table>
<thead>
<tr>
<th>Four Key Actions</th>
<th>Process Steps &amp; Key Words</th>
<th>Tool Matrices</th>
<th>Key Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>D0 Implement Immediate Protective Actions</td>
<td>D0-D2 Tools</td>
<td>1. Was the suspect population identified and contained?</td>
</tr>
<tr>
<td>Action 2</td>
<td>D1 Form the Team</td>
<td>D4 Tools</td>
<td>2. Were the appropriate stakeholders, disciplines and experts engaged to complete the analysis?</td>
</tr>
<tr>
<td>Interim</td>
<td>D2 Define the Problem</td>
<td>D4 Tools</td>
<td>3. Is the problem defined and supported with data?</td>
</tr>
<tr>
<td>Action 3</td>
<td>D3 Complete Interim Containment Actions</td>
<td>D4 Tools</td>
<td>4. Were interim (temporary) actions verified not to cause other problems?</td>
</tr>
<tr>
<td>Permanent</td>
<td>D4 Identify, Analyze and Verify Root Causes</td>
<td>D4 Tools</td>
<td>5. Were the direct cause/generation point and detection cause/escape point identified?</td>
</tr>
<tr>
<td>Action 4</td>
<td>D5 Identify Permanent Corrective Actions</td>
<td>D5-D6 Tools</td>
<td>6. Was the cause of the system breakdown determined?</td>
</tr>
<tr>
<td>Preventive</td>
<td>D6 Implement Permanent Corrective Actions</td>
<td>D5-D6 Tools</td>
<td>7. Is RCCA tool usage appropriate and evident?</td>
</tr>
<tr>
<td></td>
<td>D7 Define Systemic Preventive Actions</td>
<td>D7-D8 Tools</td>
<td>8. Have permanent corrective actions been identified, verified to work, validated to be in place, and effective?</td>
</tr>
<tr>
<td></td>
<td>D8 Recognize the Team</td>
<td>Other 8D Tools</td>
<td>9. Have proper controls been put in place and documented to prevent recurrence?</td>
</tr>
</tbody>
</table>

**Key Links**
- Link to AESQ Website for RM13000 and 8D Forms

*Refer to RM13000, Appendix A, for a more detailed list of 8D Assessment Questions.*
Q & A SESSION

USE THE “CHAT” FUNCTION TO ASK A QUESTION...
SUMMARY AND CLOSE

PETER E. TETI
FELLOW, QUALITY ENGINEERING
PRATT AND WHITNEY
SUMMARY

All resources will be available on the AESQ website within a few days.

An email will be sent to all registrants with a link.
THANK YOU FOR PARTICIPATING
THANK YOU FOR PARTICIPATING
BACK-UP SLIDES

8D Step-by-Step
**D0 – IMPLEMENT IMMEDIATE PROTECTIVE ACTIONS**

**D0: Overview**

In the case where nonconforming (NCM) product has escaped to a Customer, *immediate action is taken to STOP all possibility of continued NCM shipments and contain what nonconformities have already been made*. These are actions designed to protect the Customer.

The suspect population must be identified and effectively contained. Ensure nonconforming material is segregated from production.

Consideration should be given to the following:

- Work in process
- Finished goods storage
- Goods in transit
- Customer location
- Raw material inventory

Per AS13000, D0 must be completed within 2 days (48 hours) unless otherwise agreed by the Customer.
D1 - FORM TEAM

The 8D team must include appropriate cross-functional disciplines and subject matter experts with pertinent product and process knowledge needed to conduct the investigation and establish the required corrective actions.

Consideration should also be given to inviting the affected customer to be on the team as the customer can offer a unique perspective.

Team members should be trained in the basics of 8D Problem Solving per AS13000. The event or project leader should have deeper training in the use of the process and tools.

<table>
<thead>
<tr>
<th>Team leader/co-leader</th>
<th>Team members</th>
<th>Process Owner</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Organize the event</td>
<td>• Provide specialist knowledge (Subject Matter Expert – SME)</td>
<td>• Ensure implementation is completed</td>
<td>• Enable resources</td>
</tr>
<tr>
<td>• Train participants</td>
<td>• Generate ideas</td>
<td>• Align to business need</td>
<td>• Ensure organizational commitment</td>
</tr>
<tr>
<td>• Convey methods</td>
<td>• Generate solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Coordinate activities</td>
<td>• Implement solutions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Gather the facts using a 5W-2H to define the problem. The problem definition must include:

- **Problem “Generation” (discovery) point:** Where in the process was the non-conformance detected?

- **Problem manifestation:** What are the indications that a problem exists? The problem should be described in terms of customer experience.
  - Customer/engineering requirement versus actual results
  - When it failed (date/time)
  - Where it failed (location, assembly, at customer, in service, etc.)
  - Failed quantity (WIP, finished goods, in transit, at customer location, etc.)
  - Nonconformity photos as necessary

- **Problem impact:** What is the impact in terms of quality, reliability and productivity? These are best expressed in financial terms.

### 5W2H PROBLEM DEFINITION FORM

<table>
<thead>
<tr>
<th>5W</th>
<th>2H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is the problem?</strong> Describe it in a single sentence, so that others will be able to understand what you mean. Describe what the requirement is and what the actual condition is.</td>
<td>The Customer requirement is… The actual condition is… The problem failure mode is…</td>
</tr>
<tr>
<td><strong>Why is it a problem? What is the pain?</strong></td>
<td>This is a problem because… Note: This is where we can describe why the product is not currently usable (i.e., does not fit into next higher assembly, etc.)</td>
</tr>
<tr>
<td><strong>Where do we encounter the problem?</strong> From the process flowchart, we encounter the problem at (Location) (Time) when (Specific circumstance).… Note: This is where we can define the process Generation Point and Escape Point.</td>
<td></td>
</tr>
<tr>
<td><strong>Who is impacted?</strong> This impacts: (Customer) by…, (Management) by…, (Operator) by … (others) by… Note: Customer impact may need to come from Engineering analyzing the impact of the failure mode.</td>
<td></td>
</tr>
<tr>
<td><strong>When did we first encounter the problem?</strong> We first encountered this problem… Note: Time and date stamp goes here.</td>
<td></td>
</tr>
<tr>
<td><strong>How did we know there was a problem?</strong> The symptoms of this problem are… Example: An assembler noticed oil leaking on the floor; a smell of oil was noticed by the end-user, etc.</td>
<td></td>
</tr>
<tr>
<td><strong>How often do we encounter this problem?</strong> We encounter this problem (x) times and each encounter is (this big). The problem is getting (better/worse).</td>
<td></td>
</tr>
</tbody>
</table>
D3 – COMPLETE INTERIM CONTAINMENT ACTION(S)

Also referred to as “Temporary Containment Action” taken to get good product to the Customer so they can get PRODUCTION going again.

Example include:

1) The over-inspection of suspect material from a bounded population and separating the good from the bad in order to ship the good product to the Customer in order to keep their production line moving.

2) Setting up a rework or repair line to address the nonconforming product

Key D3 Actions include:

1) Select and implement the most effective containment action.
2) Work with the customer to determine the locations of affected product and the responsibilities, methods and timescale to contain that product.
3) Check that the containment action is effective. Read across to other affected product as appropriate.
4) Maintain records of containment as required by the customer.
5) Notify customer of resumption of shipping as agreed to by customer.
D4 - IDENTIFY, ANALYZE AND VERIFY ROOT CAUSES

Investigate Potential Causes

Collect and analyze data to determine potential causes or factors contributing to the non-conformance. Validate the measurement system used in conjunction with the problem (gauge, inspection and/or control plan, etc.) and ensure that it provides valid, accurate information.

Brainstorm potential investigation paths if data and facts are not readily available for analysis.

Use the appropriate investigation tool to organize and prioritize potential causal factors.

FISHBONE DIAGRAM

CAUSE / EFFECT TREE DIAGRAM

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D4 - IDENTIFY, ANALYZE AND VERIFY ROOT CAUSES

Verify Root Cause(s)

Verify the root cause(s) identified by conducting a test attempting to replicate the event. Tools that can be used to confirm root cause(s) are:

- Scatter diagram showing input/output relationships
- Design of experiments (DOE) used to test the impact of two or more variables on an output

(Additional tools can be found on the D4 tools matrix page)
D5 - DETERMINE PERMANENT C/A(s)

The team shall identify and evaluate potential permanent corrective actions to prevent reoccurrences. Consideration should be given to:

- Short term (may be a D3 action) and long term solutions
- Feasibility
- Timing
- Budget
- Employee involvement

Suggest using a Solution Selection Matrix – see the D5 Tools Matrix page
D6 – IMPLEMENT PERMANENT C/A(s)

Key D6 Actions

• Plan the implementation of the permanent corrective actions (PCA).
• Implement the permanent corrective actions that fix the root causes.
• Verify that the root causes are fixed and that the problem will not happen again.
• Implement the corrective actions that fix the quality control system at the generation and escape point(s) ensuring that it will detect and not release the problem again.
• As required, remove containment measures when it’s no longer detecting non-conformant products.
• Update the appropriate quality documentation as required by the customer (such as PFMEA and the control plan).
• Check that the corrective actions continue to be effective by monitoring through inclusion into the internal auditing program.
The RRCA team shall apply the use of mistake-proofing strategies to control the cause(s) of the failure.

Level one mistake proofing that prevents the error at its source is the goal.

Level two or three mistake proofing that prevents errors from escaping to the customer would be the next best option.
D7 – DEFINE SYSTEMIC PREVENTIVE ACTION(S)

Monitor and Control Using Data

Process monitoring and control can be accomplished by:

- Using simple tools such as run charts or control charts to monitor the process for consistency
- Using a histogram to evaluate if the process is capable of meeting customer requirements
- Using an elephant chart to monitor if the process controls implemented are still effective
- Modifying PFMEA to account for failure modes, their causes and updated preventative and detection based controls
- Updating control plan with process and mistake-proof controls used to mitigate occurrence and/or drive detection reliability
D7 – DEFINE SYSTEMIC PREVENTIVE ACTION(S)

Apply Read-Across to Similar Parts/Processes

GOAL: Prevent recurrences

The 8D investigation is expected to resolve any other related process and/or product issues that could benefit from the work done on the targeted failure.

Consider the following questions:

1) Could the process condition that led to the non-conformance for one part number be present on other similar part numbers?

2) Could this event also be happening in another cell, building, or plant site that produces similar product or service?

3) Who else could benefit from the lessons learned from this investigation?

4) Have PFMEA documents been updated?
D8 – RECOGNIZE THE TEAM

Once a team has completed implementing the solution, applied the read-across and ensured that the solution is effective, all team members deserve to be congratulated.

Team members need to know that their efforts are appreciated and that the organization knows about their accomplishments.

Examples of team recognition include issuing a certificate to each member, throwing a pizza party, a congratulatory email or recognition at a staff meeting.

See D7-D8 Tools Matrix for template